P23221 MONOCULAR OCULOMETRIC PERFORMANCE IS BETTER WITH THE DOMINANT EYE

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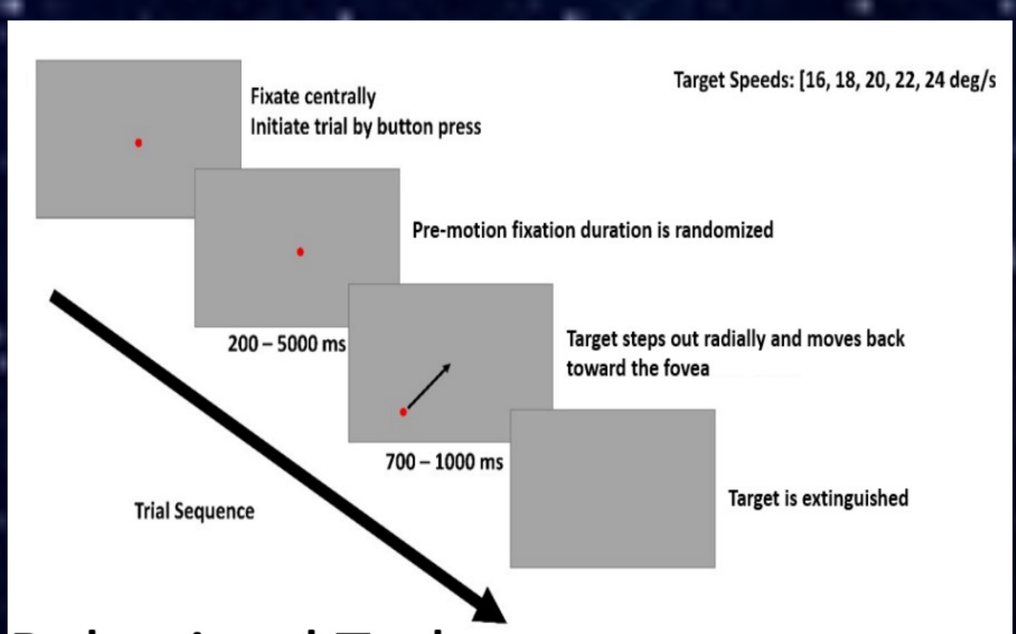
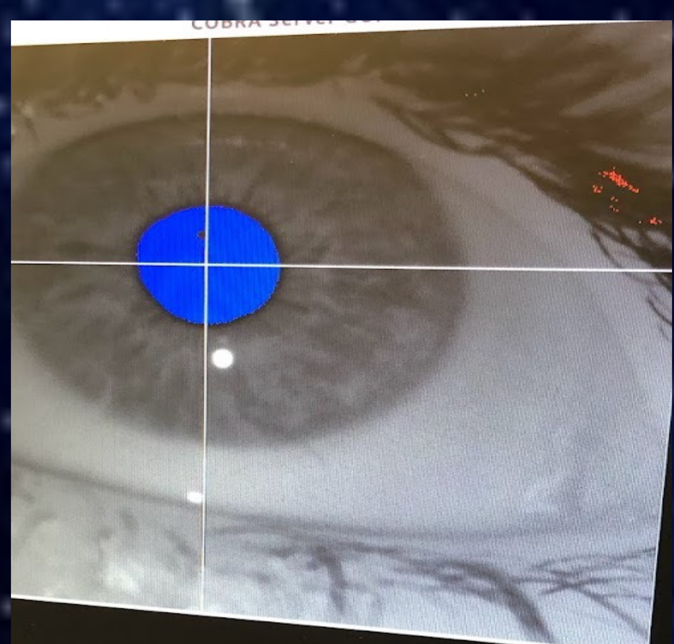
• Introduction

Most crew members experience some aspect of Spaceflight Associated Neuro-ocular Syndrome (SANS) postflight, including visual acuity decrements and ocular structural changes. These SANS symptoms often appear to manifest themselves more severely in one eye. This study seeks to establish baseline measures of visual performance, under monocular viewing conditions, appropriate for potential future comparison with demographically matched crew members postflight to detect functional correlates of any observed ocular structural changes. Given that performance may be different for dominant vs. non-dominant eye, we also seek to establish baseline measures of any eye-dominance effects on these performance metrics to better interpret the significance of any observed differential structural effects between the two eyes in SANS or other retinal pathologies (see poster P23308).

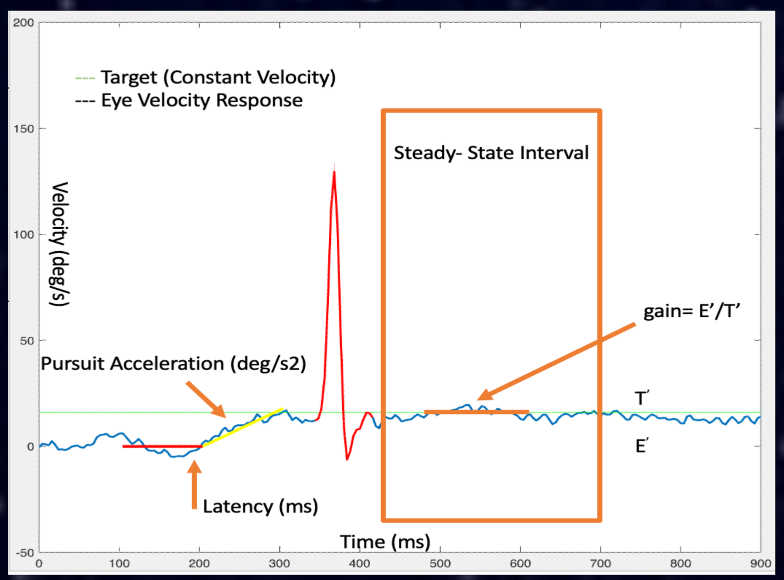




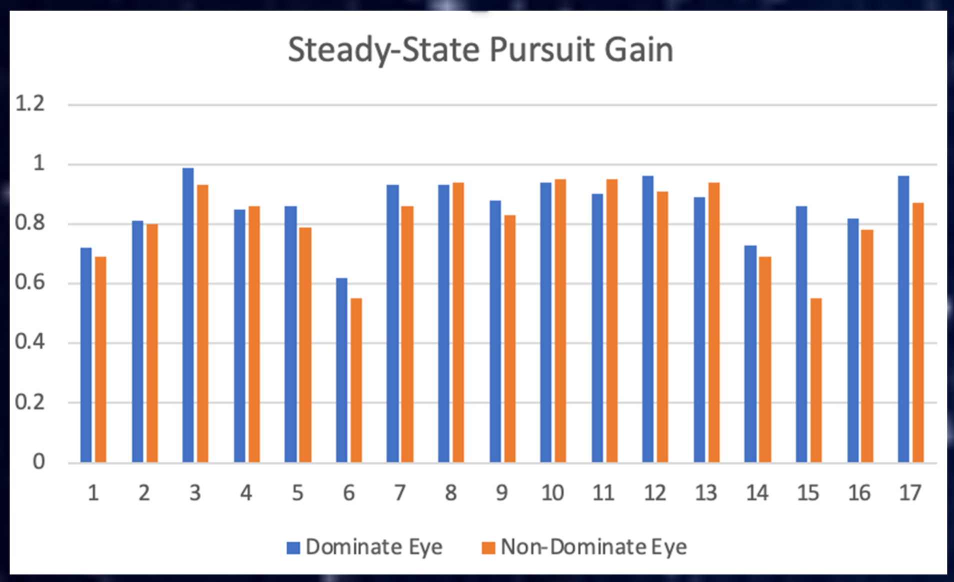
• Methods

We simultaneously measured 19 visuomotor performance metrics (oculometrics) using a 5-minute radial ocular tracking task, the Comprehensive Oculomotor Behavioral Response Assessment (COBRA), in 17 (age: 24—55, 7 females) healthy astronaut-like participants under three viewing conditions: driven monocularly by the dominant eye, driven monocularly by the non-dominant eye, and driven binocularly. Briefly, participants were asked to perform an eye dominance "Miles test" followed by running the COBRA task (Stone et al.., 2019) in one of the three viewing conditions in random order.

We compared performance for the dominant vs. non-dominant eye using one-tailed paired t-tests given that we have a prior hypothesis that performance will be better for the dominant eye.



Eye velocity trace from a single trial showing the computed latency, initial acceleration, and steady-state gain in the interval 400-700ms after motion onset. The red spike is an identified saccade.

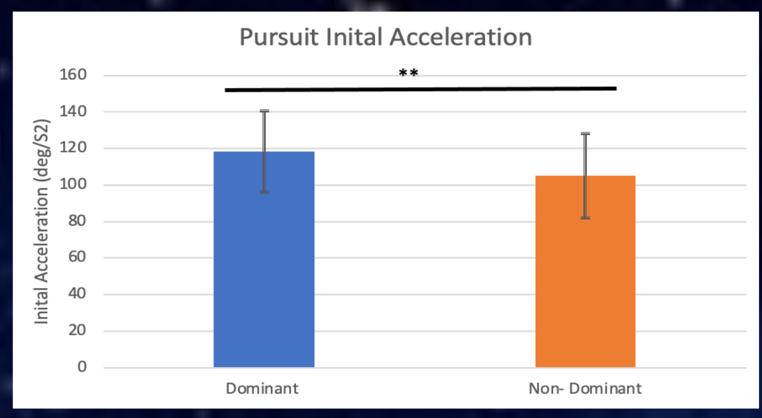


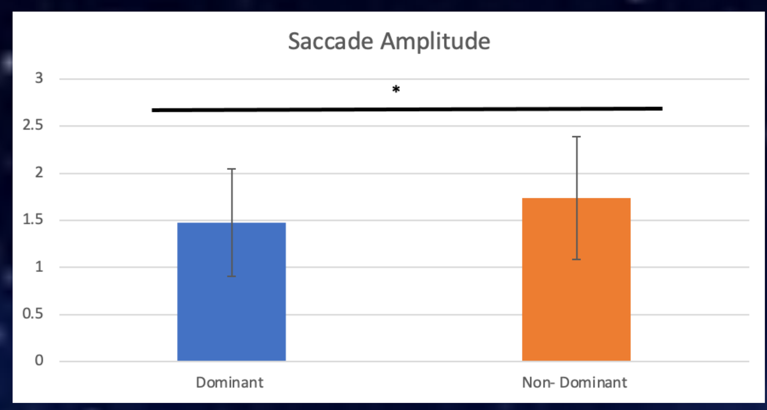
Steady-state gain for the Dominant and Non-Dominant eyes for all 17 participants. Note that in all but 5 cases, gain was higher for the dominant eye.

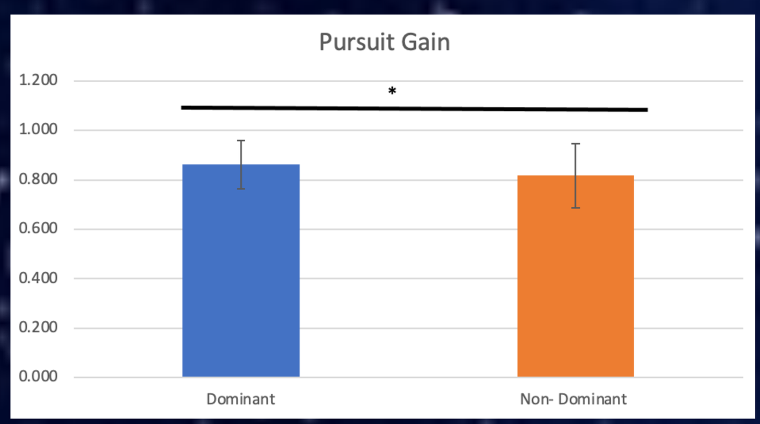
• Results

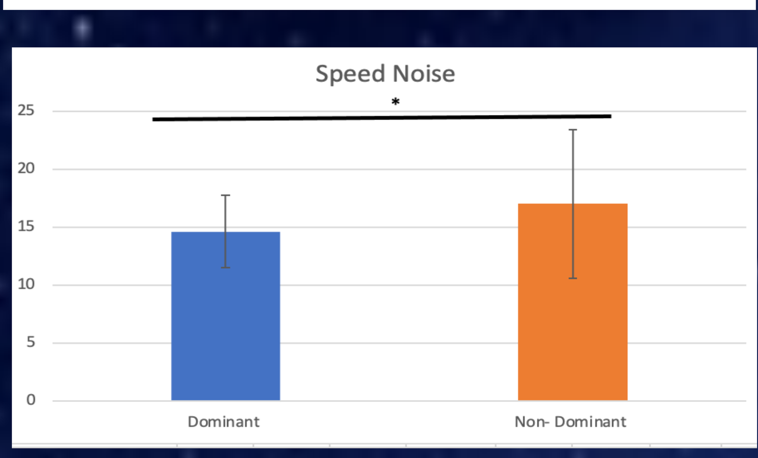
	Latency (ms)	Accel (deg/s2)	Gain	% Smooth	Sac Rate (Hz)	Sac Amp (deg)	Sac Dispersion(˚)	Dir Noise (˚)	Direction Anisotropy	Direction Asymmetry	Speed Noise (deg/s)	Speed Slope
Mean	168	112	0.84	.77	3.70	1.61	29.8	10.3	0.23	-0.23	15.8	0.50
SD	15	23	0.12	.05	0.62	0.61	37.3	3.1	0.15	1.32	5.0	0.31

➔ We compiled a preliminary monocular baseline for 12 oculometrics.









➔ Initial acceleration (open-loop gain) was, on average, 12.7% higher ($p < 0.002$), steady-state (closed-loop) gain was 5.5% higher ($p < 0.02$), and catch-up saccades were 15.1% smaller ($p < 0.02$)

➔ Speed noise was 14% lower ($p < 0.05$, although only borderline at $p = 0.064$, if one outlier is removed) and direction noise appears 11.5% lowers ($p = 0.061$). More subjects are needed to resolve motion processing effects.

➔ Seven other oculometrics, including latency, appear similar for both eyes.

• Discussion

Our data establish a baseline and distribution for monocularly-driven ocular tracking performance in a healthy crew-matched population.

We have found a significant enhancement in three (and likely 5) key metrics of visuomotor performance when driven by the dominant eye.

The baseline data we are collecting will allow for the functional assessment of potential pathology of a given retina using our visuomotor task, without a within-subject control measurement, thus enabling across-subject testing by comparing performance metrics of ocular tracking driven by a candidate potentially impaired retina with those when driven by a single healthy retina, accounting when necessary for potential performance differences due to eye dominance (see Berneshawi et al., P23308, IWS, 2023).

Future work will include a comparison of structural/physiological factors with our functional markers of eye dominance and health.

• Acknowledgments

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